

The BASC Newsletter, Volume 4, Number 2, is your update on the activities of the Board on Atmospheric Sciences and Climate of the National Academies. The Board seeks to advance understanding of the Earth's atmosphere and climate, to help apply this knowledge to benefit the public, and to advise the federal government on issues within the Board's areas of expertise. This newsletter can be viewed in its entirety at the [BASC website](#).

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1. Message from the Chair

Three years ago, when Bob Serafin began his term as chair of BASC, the question of the times was "is climate changing?" There has been real progress both in our scientific understanding, and in the general acceptance of this understanding, in just three years, and the question is no longer whether climate is changing. It is. The evidence is strong and reliable, most notably in the Arctic. Yes, climate has always been variable, but the science is clear that current change is outside the norm. Changes in climate have always had effects on human populations and ecosystems and caused by human activity. The more significant or rapid the change, the more challenging it is for people to adjust. The current scope and degree of these challenges, and how we will respond, are the key questions now.

I'm pleased to take over as the chair of BASC at such an important time. I believe that the National Academies can serve as a credible, independent source of the best scientific thinking on climate issues just when such information is most needed. Thirty years ago, I was deeply involved in recognizing the chlorofluorocarbon-ozone depletion relationship and from that experience can see the direct link between advances in scientific understanding and public policy. This September marks the 20th anniversary of the signing of the Montreal Protocol, an event that basically ended reliance on CFCs. This landmark still stands as one of the most effective global policy reactions ever to an environmental problem, and it illustrates that we can understand a problem well enough to make pointed, appropriate changes in response. Because the CFCs also contribute significantly as greenhouse gases, their elimination under the Montreal Protocol also carries an effect comparable to the global actions toward greenhouse gas control taken to date under the Kyoto Protocol!

Much work remains to be done to ensure that science contributes to today's climate policy discussions. We need a solid scientific foundation for any and all responses that are planned. One critical need that must not be forgotten is the need for continuing accurate scientific

measurements of greenhouse gases; we also need to develop a more sophisticated understanding of the likely consequences, both positive and negative, of proposed regulatory actions (i.e., will the actions produce demonstrable, measurable improvements). We need better understanding of adaptation options, as well as mitigation, and especially at the regional level. There are still many fundamental questions about the climate system, forcings, and feedbacks that need to be answered, and advances in modeling, observation technologies, and the other tools are needed to make continued progress. I see BASC as an important actor in such work and as a significant resource to the nation.

F. Sherwood Rowland, chair

2. Upcoming Meetings

- September 4-7, 2007: Review of CCSP's SAP 1.3, Washington, D.C.
- [September 11-13, 2007: Review of CCSP's SAP 2.4, Boulder, CO](#)
- September 10-11, 2007: Climate Change and Health Workshop, San Francisco, CA
- [October 29-31, 2007: Mesoscale Meteorological Observational Capabilities, Norman, OK](#)
- [November 5-6, 2007: Climate Research Committee, Washington D.C.](#)

3. What's New

-- New Report: [Review of the U.S. Climate Science Program's Draft Synthesis and Assessment Product 3.3 "Weather and Climate Extremes in a Changing Climate"](#) reviews a draft of the U.S. Climate Change Science Program (CCSP) Synthesis and Assessment Product 3.3, Weather and Climate Extremes in a Changing Climate, the 3rd in a series of 21 CCSP products addressing important topics related to climate change. The NRC report finds that the draft provides a good and thorough assessment of the important issues regarding extreme events over North America and how they may change in the context of a changing climate. The continuity and cohesion among the chapters could be improved by greater coordination among the chapter authorship teams, who should also ensure that the tone and scope of the chapters are consistent with the document's Abstract and Executive Summary. The authors should strive to consolidate the sections on tropical cyclones; however, the discussion of drought and ecological impacts could be expanded. Overall, the committee finds that the scope, content, and scientific rigor of the current draft provide a solid basis for the final version of Synthesis and Assessment Product 3.3.

-- New Study: Review of CCSP's SAP 1.3: Re-analyses of historical climate data for key atmospheric features: implications for attribution of causes of observed change. The purpose of SAP 1.3 is to provide an expert assessment of the capability and limitations of state-of-the-art climate reanalyses, to describe past and current climate conditions, and the consequent implications for scientifically interpreting the causes of climate variations and change. The information will provide a basis for decision- and policy-makers to understand the present level of confidence and uncertainties in describing how the climate system has varied in the recent historical past, and how this has enabled, and in some cases limited, our ability to identify the causes of such variations. The SAP will conclude with a discussion of steps that could be taken to improve future analyses and reanalyses of the climate system, and how this information can be developed and applied more effectively to increase confidence and reduce uncertainties in interpreting the causes for past and ongoing climate variations and change.

-- New Study: [Review of CCSP's SAP 2.4: Trends in Emissions of Ozone-depleting Substances and Recovery](#). The purpose of SAP 2.4 is to synthesize the current state of understanding about ozone changes over North America, the contributions of the United States to ozone-depleting

substances, and the UV changes due to the ozone layer changes over the North American continent. The NRC committee will provide a peer review of CCSP SAP 2.4.

-- New Study: [Review of CCSP's SAP 3.2](#): Climate Projections Based on Emissions Scenarios for long-lived radiatively active trace gases and future climate impacts of short-lived radiatively active gases and aerosols. The purpose of SAP 3.2 to provide information to those who use climate model outputs to assess the potential effects of human activities on climate, air quality, and ecosystem behavior. A discussion of potential interactions between climate and emission controls driven by local and regional air quality issues will be included. The SAP will develop climate projections for research and assessment based on the range of scenarios of long-lived greenhouse gas emissions and atmospheric concentrations developed by SAP 2.1a, and it will provide an assessment of the sign, magnitude, and duration of future climate impacts due to changing levels of short-lived gaseous and particulate species, that may be subject to future mitigation actions to address air quality issues. The SAP will also contribute to and enhance the ongoing and iterative international process of producing, analyzing, and assessing climate projections based on a range of emission scenarios for both long-lived and short-lived radiative species, and it will examine potential climate impacts of methane emission scenarios, as well as emission scenarios for short-lived radiatively active gases and particles that are influenced if not determined by local and regional air quality issues.

-- Upcoming New Study: Evaluation of the Multifunction Phased Array Radar Planning Process is an ad hoc committee that will evaluate the planning to date related to continued development of multifunction phased array radar (MPAR). Specifically, the committee will evaluate whether the planning process to date has been comprehensive and inclusive; whether the June 2006 report issued by a Joint Action Group (JAG) from the Office of the Federal Coordinator for Meteorology (OFCM) has identified the full range of benefits, costs, challenges, and potential participants; whether cost estimates to date are realistic, represent the best available information, and exclude any potential life-cycle benefits or costs; whether there are any significant gaps or errors in initial planning; whether appropriate areas of uncertainty have been identified and follow on risk assessments conducted; and, based on the information available to the committee, whether the MPAR planning process should go forward and what improvements could be recommended. Please send nominations for this committee to Curtis Marshall (cmarshall@nas.edu).

4. Special Feature: Climate Research Committee Forums

As a standing committee under BASC, the Climate Research Committee (CRC) is charged with fostering research aimed at advancing our understanding of the physical basis of climate and climate change. Among other activities, the CRC holds forums at its semi-annual meetings to explore current topics in climate and climate change research. The topics for these forums are typically developed in coordination with the committee's federal agency sponsors, often with the intent to increase exposure and interest in important, underappreciated, or novel climate research topics. Some examples of recent forums include:

- The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR4) (May 17, 2007). Questions addressed at this session, which was held jointly with BASC, included:
 1. What are the key outstanding questions and high-priority research needs emerging from the Working Group I, II, and III contributions to the IPCC AR4?
 2. How can Working Group I research (the physical basis for climate change) better inform Working Group II (impacts and adaptation) and Working Group III (mitigation strategies)?
 3. What kind of research program would help improve the reliability of regional-scale results from coupled global climate models in order to increase confidence in future climate change projections?

- Development of an Abrupt Climate Change Early Warning System (December 1, 2006). Questions addressed at this session, which was held jointly with BASC and with the NRC's Committee on Human Dimensions of Global Change, included:
 1. How firm is our understanding of the mechanisms and consequences of an abrupt change in the climate system (of sufficient magnitude to be socio-economically and/or environmentally disruptive) upon which to build the framework of an early warning system?
 2. What are the most likely mechanisms that could trigger an abrupt change in the climate system within the next century?
 3. What improvements in observing and analysis capabilities are needed to provide us with the greatest potential for early detection of abrupt changes, or related processes and feedback mechanisms?

Other recent forum topics have included:

- Seamless Prediction and "Year of Tropical Convection" (May 17, 2007)
- Development of Integrated Earth System Analysis Capabilities (March 22, 2006)
- Seasonal-to-Interannual Climate Forecasts (April 13, 2005)
- Characterizing and Communicating Climate Change Uncertainties (October 26, 2004)

The CRC also serves as the U.S. National Committee for the World Climate Research Programme (WCRP) of the World Meteorological Organization and the International Council of Scientific Unions. In this capacity, the CRC has helped design WCRP activities, evaluated the effectiveness of U.S. participation in these activities, and reviewed their accomplishments. In addition, the CRC now reserves a portion of its fall meeting each year to facilitate interactions between the WCRP and U.S. federal agencies. Some of the questions that were discussed at the most recent of these sessions (November 30, 2006) included:

1. How does the WCRP intend to facilitate, coordinate, and address more detailed aspects of the anthropogenic influences on climate, both those that may be considered intra-WCRP (e.g., sea-level rise from the decay of ice sheets) and those that span WCRP and Earth System Science Programs?
2. How can the WCRP help address the persistent problem of biases in climate models (e.g., tropical biases, simulation of El Niño-Southern Oscillation and Madden-Julian Oscillation, global precipitation biases) that degrade their value in projecting climate change?
3. What can the WCRP do to help obtain data from various countries? How can it help develop collaborations to obtain data and enhance interactions?

The next CRC meeting is scheduled for November 5-6 in Washington, D.C., and it will include a session focused on U.S. involvement in WCRP activities. Meeting details will be posted on the web at <http://dels.nas.edu/basc/crc.shtml> as they become available. Please contact CRC Program Officer Ian Kraucunas (ikraucunas@nas.edu), Research Associate Leah Probst (lprobst@nas.edu), or Senior Project Assistant Katie Weller (kweller@nas.edu) if you have questions or would like to receive additional information about the CRC.

5. Recently Released Reports

[Review of the U.S. Climate Science Program's Draft Synthesis and Assessment Product 3.3 "Weather and Climate Extremes in a Changing Climate"](#) reviews a draft of the U.S. Climate Change Science Program (CCSP) Synthesis and Assessment Product 3.3, Weather and Climate Extremes in a Changing Climate, the 3rd in a series of 21 CCSP products addressing important topics related to climate change. The NRC report finds that the draft provides a good and thorough assessment of the important issues regarding extreme events over North America and how they may change in the context of a changing climate. The continuity and cohesion among the chapters could be improved by greater coordination among the chapter authorship teams, who should also ensure that the tone and scope of the chapters are consistent with the document's Abstract and Executive Summary. The authors should strive to consolidate the

sections on tropical cyclones; however, the discussion of drought and ecological impacts could be expanded. Overall, the committee finds that the scope, content, and scientific rigor of the current draft provide a solid basis for the final version of Synthesis and Assessment Product 3.3.

[Analysis of Global Change Assessments: Lessons Learned](#) informs decision makers about the scientific underpinnings of a range of environmental issues, such as climate change, stratospheric ozone depletion, and loss of biodiversity. Dozens of assessments have been conducted to date by various U.S. and international groups, many of them influencing public policies, technology development, and research directions. This report analyzes strengths and weakness of eight past assessments to inform future efforts. Common elements of effective assessments include strong leadership, extensive engagement with interested and affected parties, a transparent science-policy interface, and well defined communication strategies. The report identifies 11 essential elements of effective assessments and recommends that future assessments include decision support tools that make use of information at the regional and local level where decisions are made.

[Review of the U.S. Climate Science Program's Synthesis and Assessment Product 5.2, "Best Practice Approaches for Characterizing, Communicating, and Incorporating Scientific Uncertainty in Climate Decision Making"](#) reviews the U.S. Climate Change Science Program's new draft assessment product on characterizing and communicating uncertainty information for climate change decision making, one of 21 climate change assessment products that the program is developing to meet the requirements of the 1990 Global Change Research Act. Although the draft assessment is effective in discussing methods of characterizing uncertainty, it falls short in several ways. It is written for researchers involved in assessment efforts and will likely be of use to them, but does not address other key audiences, particularly policymakers, decision-makers, and members of the media and general public. In addition, it does not assess the full range of "best practice approaches" for characterizing, incorporating, and communicating uncertainty. These weaknesses were due in part to a change in the prospectus after the process had begun to include new target audiences and a different scope of work. It will take a substantial revision of the current draft or production of a companion document, both requiring additional authors, to address these issues.

6. Studies in Progress: for more information about a specific project, click on the link.

[Developing Mesoscale Meteorological Observational Capabilities to Meet Multiple National Needs](#) will develop an overarching vision for an integrated, flexible, adaptive, and multi-purpose mesoscale meteorological observation network and seek to identify specific steps to help develop a network that meets multiple national needs in a cost-effective manner. The study will focus primarily on mesoscale observational requirements over the United States and adjacent coastal zones, with emphasis on characterizing the planetary boundary layer, forecasting on time scales up to 48 hours, and the needs of urban areas. It will provide a practical approach, stressing applications and how to design and implement a system that will significantly improve users' decision making. The study will also address the roles of federal, state, and local government and by commercial entities.

[Archiving and Accessing Environmental and Geospatial Data at NOAA](#) will assist NOAA as it develops plans to meet its data archiving and data access requirements. A preliminary set of principles and guidelines for data archiving developed in the Committee's interim report, [Preliminary Principles and Guidelines for Archiving Environmental and Geospatial Data at NOAA: Interim Report](#), will be refined and expanded using community input in a final report that also addresses the extent to which a wide variety of data sets should be made available. The committee's final report will also include specific examples of how these principles and guidelines could be applied to existing and planned data streams across NOAA.

[Scientific Accomplishments of Earth Observations from Space](#) will document major scientific accomplishments resulting from the unique vantage point provided by satellite observations of the Earth system. The study's main objective will be to document, using examples and explanation, how satellite observations uniquely contributed to scientific understanding of the atmosphere, ocean, land, biosphere, and cryosphere. The study will also address how satellite observations have contributed to the ability to predict variations in the Earth system (e.g., weather, climate variability, water availability, earthquakes, volcanoes, and tsunamis) and comment on opportunities to improve future Earth science research enabled by the vantage point of space.

7. BASC in the Past: The National Weather Service Modernization

The 1990s was a decade of rapid and significant change for the National Weather Service. These changes, known collectively as the NWS Modernization, were driven by a \$4.5B investment in technology and an organizational restructuring. New technologies deployed nationwide included the Next Generation Doppler Radar Network (NEXRAD) and the Automated Surface Observing Systems (ASOS). Data collected from these systems were made available to forecasters in the newly restructured Weather Forecast Offices (WFOs) via a new state-of-the-art workstation environment, the Advanced Weather Information Processing System (AWIPS).

BASC and its predecessors at the Academies were an integral part of the Modernization effort, from conception to implementation and beyond. In 1980, the NRC Select Committee on the National Weather Service outlined the concept in *Technological and Scientific Opportunities for Improved Weather and Hydrological Services in the Coming Decade*. In 1989, NRC established the National Weather Service Modernization Committee at the request of NOAA. During the following decade, this standing committee and its ad hoc panels authored 15 reports that examined topics ranging from technical analyses of NEXRAD coverage to educational requirements for meteorologists employed by the federal government. These reports ensured that NOAA incorporated the perspectives of all stakeholders of NWS products and services, including government, industry, and academia, as the agency moved forward with the Modernization process.

The committee issued its final report, *A Vision for the National Weather Service: Road Map for the Future* (1999) as the Modernization was nearing completion. The committee recommended that the NWS should conceive of and implement a strategy to further capitalize on the major technology investments of the 1990s. Indeed, those investments had already yielded significant increases in forecast skill and lead times for severe weather warnings. The committee emphasized that capitalizing upon the achievements of the 1990s and continuing to improve weather-related information services in the early years of the Twenty-First Century would require the NWS to further consider and incorporate broader advances in science and technology.

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We encourage your comments on this newsletter as well as on the reports and activities of BASC. To provide input, contact basc@nas.edu. To unsubscribe, contact basc@nas.edu.

BASC is a unit of the National Academies. The nation turns to the National Academies -- National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council -- for independent, objective advice on issues that affect people's lives

worldwide. BASC members include: F. Sherwood Rowland (chair), University of California, Irvine; M. Joan Alexander, NorthWest Research Associates; Rosina M. Bierbaum, University of Michigan; Carol Anne Clayson, Florida State University; Walter Dabberdt, Vaisala Inc.; Kerry A. Emanuel, Massachusetts Institute of Technology; Dennis L. Hartmann, University of Washington; Peter R. Leavitt, Weather Information Inc.; Thomas H. Vonder Haar, Colorado State University; Chris Elfring (director, BASC).

We encourage you to share this newsletter with colleagues. If they would like to be added to the email list, a simple request to basc@nas.edu is all that is needed.